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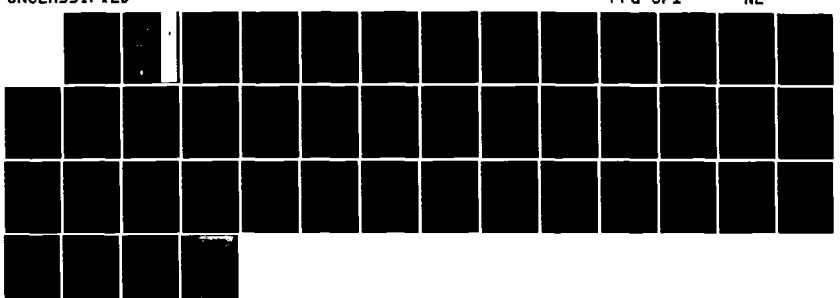

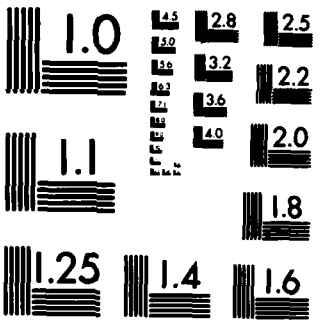

REGIONAL PETROLEUM RESERVE PUERTO RICO

PERFORMANCE CRITERIA LEVEL II

U S ARMY
CORPS OF ENGINEERS
HUNTSVILLE DIVISION

REGIONAL PETROLEUM RESERVE PERFORMANCE CRITERIA (LEVEL II)

FOR

PUERTO RICO

Prepared by:

U.S. ARMY CORPS OF ENGINEERS
HUNTSVILLE DIVISION

Prepared for:

U.S. DEPARTMENT OF ENERGY
STRATEGIC PETROLEUM RESERVE
WASHINGTON, D.C.

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STORAGE (SPR)	FUEL OIL	PUERTO RICO

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

THIS CRITERIA, PREPARED FOR U.S. DEPARTMENT OF ENERGY STRATEGIC PETROLEUM RESERVE, IS DESIGNED TO BE USED BOTH AS A GUIDE AND AS A POLICY DOCUMENT BY THE RPR PROJECT MANAGEMENT OFFICE (PMO) TO ASSURE THAT UNIFORM DESIGN AND CONSTRUCTION APPROACHES ARE TAKEN BY APPROPRIATE CONTRACTORS. THE CRITERIA SHALL ALSO ENABLE THE SPR PMO TO ESTABLISH A HIGH LEVEL OF OPERATIONAL READINESS AND MANAGEMENT WHILE OPTIMIZING LIFE CYCLE COSTS.

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REGIONAL PETROLEUM RESERVE - PERFORMANCE CRITERIA

LEVEL II

1.0 SCOPE

1.1 PURPOSE

This criteria shall be used both as a guide and as a policy document by the RPR Project Management Office (PMO) to assure that uniform design and construction approaches are taken by appropriate contractor(s). The criteria shall also enable the SPR PMO to establish a high level of operational readiness and management while optimizing life cycle costs.

1.2 APPLICATION

This criteria applies to planned locations in Puerto Rico of the Regional Petroleum Reserve and all contractors and subcontractors who are designing hardware or software, or developing, constructing, operating or maintaining Government-owned or leased facilities; and contractors who handle, store, ship or transfer RPR petroleum or naphtha.

2.0 APPLICABLE DOCUMENTS

RPR System Criteria (Level I)

Federal, Commonwealth, Local Codes and Regulations

Industry Standards

The design of RPR facilities shall meet all requirement of documents listed above to the extent applicable. Design Criteria (Level III) shall specify applicable parts of codes and standards.

3.0 REQUIREMENTS

3.1 SYSTEM DEFINITION

As a response to the 1973-1974 oil embargo, the Congress passed the Energy Policy and Conservation Act (EPCA), P.L. 94-163, which authorizes the creation of a Strategic Petroleum Reserve of up to one billion barrels of crude oil and petroleum products.

To implement EPCA, a Strategic Petroleum Reserve Plan was developed by the Federal Energy Administration (FEA) and transmitted to the Congress as Energy Action No. 10 on February 16, 1977, and became effective on April 18, 1977. During 1979, the Administration announced that 24.3 million barrels in regional and noncontiguous storage would be developed.

The programmatic objectives of the RPR were derived from the foregoing policy statements. The basic objective of the RPR program is to augment the protection value of the SPR centralized crude storage by providing further assurance that particularly vulnerable parts of the United States receive replacement petroleum supplies in a timely manner during petroleum import interruptions.

The specific objectives of the Regional and Noncontiguous Storage Project in Puerto Rico are:

- To build, fill, and have in operation within 5 years of authorization, an 800,000 barrel crude oil reserve and a 500,000 barrel naphtha reserve for Puerto Rico.

- To utilize proven technology with respect to mechanical, electrical, instrumentation, control, and structural features required to fill, store, and drawdown the regional and noncontiguous facilities.

- To ensure that all facilities be constructed to yield a functional life of at least 20 years.

3.2 GENERAL DESCRIPTION

The Puerto Rico site will store 800,000 barrels of crude oil and 500,000 barrels of naphtha. Of the crude oil, 400,000 barrels will be sweet crude equivalent to SPR Type V and 400,000 barrels will be a sour crude equivalent to SPR Type VI. The stored naphtha will be divided between 375,000 barrels of naphthenic-aromatic type and 125,000 barrels of paraffinic type.

3.2.1 CATANO NAVAL FACILITY

The Catano facility is located in the San Juan Harbor and is being used jointly by ESSO Oil, Shell Oil, and Texaco Oil Companies. The facility is served by the Catano Fuel Pier located less than a mile to the East. Oil fill will be accomplished by tankers at the dock facility using tanker pumping capabilities. Drawdown will be by pipeline connection to the dock and/or adjacent Gulf oil refinery and by barge or tanker to the other refineries in the island.

3.2.2 ROOSEVELT ROADS

This site is located in the southeast side of the island and is within the Roosevelt Roads Naval Station. Thirty acres of the Naval facility will be made available for SPR storage. Ship transfer facilities for crude and naphtha will be at the Navy Pier No. 1 in Ensenada Honda. The storage will be filled using the ship's pumping capabilities via 14-inch crude oil and 14-inch naphtha pipeline over 30-hour period. A facility pumping station will be used for drawdown for loading onto barges or tankers.

3.2.3 YABUCOA

The Yabucoa site is south of and adjacent to the Sun Oil storage facility. Transfer of crude oil and naphtha from ships will be at the Sun Oil Pier. Storage facilities shall be filled by using the ship's pumping capabilities. Crude oil and naphtha shall be pumped through the Sun Oil 24-inch and 14-inch sleeper lines from the dock to the Sun Oil tank storage. A connection at this point shall allow transfer to the SPR storage facility. Drawdown of crude or naphtha shall be accomplished through a new pipeline into the Sun Oil sleepers to the dock.

3.2.4 GUAYANILLA

The Guayanilla facility is near the CORCO and Peerless Refineries and the Union Carbide petroleum plant. Transfer facilities for ships will be at the CORCO Tallaboa dock facilities. The storage facilities will be filled using the ship's pumps to pump crude oil from the CORCO Tallaboa dock to storage. Naphtha will be pumped through the existing CORCO 14-inch sleeper. Drawdown will be the reverse of fill. A 12-inch crude oil pipeline from the storage site to the CORCO tank farm will allow supply of crude oil to CORCO and Peerless. A 6-inch line will provide direct supply of naphtha to Union Carbide's tank farm.

3.3 CRUDE OIL AND NAPHTHA STORAGE

3.3.1 SITE SELECTION AND DEVELOPMENT

3.3.1.1 General Site Characteristics

The site shall be suitable for the type(s) of storage containers to be developed. Other site characteristics which must be present in varying degrees include: proximity to a major pipeline for distribution; proximity to port/terminal for fill and distribution; the availability of adequate roads; and commercial power.

3.3.1.2 Site Availability

The availability of the proposed site shall be assessed in terms of:

- current ownership
- current utilization
- method and associated timetable of obtaining site
- time required to convert site to the required storage volume
- time required to construct/install crude oil and naphtha transport system

3.3.1.2.1 Legal Constraints/Permits

Required permits will be defined to identify potential delays or work stoppages. These permits include:

- construction permits
- pipeline rights-of-way
- water diversion permits
- local, commonwealth, and federal environmental permits

3.3.1.3 Proximity to Existing Petroleum Distribution System

The expected methods of transporting crude oil and naphtha to and from storage shall be defined. Several options shall be considered to evaluate the cost, complexity, and timeliness of connecting to the transportation systems. The following features shall be identified:

- probable seaport dock(s) serving as origination point--availability and berths
- method of transport from dock to pipeline terminal or intermediate transshipment point
- current and expected flowrates through existing pipeline system
- location of required terminal connection to the existing pipeline

- method of transport between existing pipeline system or storage tank/transshipment center and the storage facility
- locations, capabilities, and configurations of refineries supplied by the RPR complex
- probable distribution plan to refineries
- required new construction
- required modification of existing system expansion of capacity or enhancement of structural strength

The costs associated with construction, modification, operation and maintenance of these transport systems should be identified, along with the cost associated with the utilization of the existing transportation systems. Estimates of the time required to design, manufacture, construct, and install additional facilities should be identified and factored into overall RPR site development decisions.

3.3.1.4 Surface Considerations

The surface area of the proposed storage site shall be described in sufficient detail to illustrate the elevation contours of the land, to locate the position of water bodies, rivers, ponds, swamps, etc., and to locate the navigable waterways, existing roadways, and ground transportation systems. This information will enable evaluation of the size and general accessibility to the site required for construction and operational purposes and will allow the identification of any unique topographical features which could prove undesirable.

3.3.1.4.1 Mechanical Properties

To insure stable structural support for aboveground facilities and storage vessels at the site, a subsurface investigation shall be performed to determine soil mechanical properties and groundwater conditions. The investigation shall be made by means of soil borings, test pits, and other methods as required.

3.3.1.4.2 Seismic Requirements

An appropriate geophysical survey of the site shall be made to evaluate the effect of seismic loads on both above and below-ground facilities. Facilities shall be designed and constructed to meet seismic Zone 3 requirements of the Commonwealth.

3.3.1.5 Supporting Systems

3.3.1.5.1 Power Sources

Power sources shall be selected after considering the following alternatives:

- public utility
- local power generation
- direct engine or turbine drive on major units
- combinations

Consideration shall be given to the need for redundant units required for system reliability.

3.3.1.5.2 Transportation Systems

The transportation systems of prime utility to the storage site include:

- seaways for transport of crude oil and naphtha
- railways for transport of construction materials or supplies
- roadway systems for transport of construction materials, supplies, personnel, and emergency vehicle traffic

3.3.1.5.3 Water

The proposed water supply shall be evaluated in terms of the total site requirements. Water for personnel use, fire protection, and equipment cooling shall be considered.

3.3.1.5.4 Sewage

Sanitary and industrial waste disposal systems for the site shall be described to insure compliance with federal and local environmental regulations. Existing waste treatment and disposal facilities in the area shall be used where practicable.

3.3.1.6 Site Security and Safety

Selected site(s) shall require a security system conforming to current established SPR physical protection system requirements. During the site selection process, the following should be considered:

- security - describe any security system existing at the candidate site that safeguards personnel and presents unauthorized access. If access to the site area is unusual, i.e., causeway or bridge, it should be noted.

- safety - identify the location of potential sources of fire or explosion in the proximity of the storage complex.

3.3.1.7 Site Validation Report

After site investigations are complete the sites shall be screened to reduce the candidates to a manageable number of sites. The final candidates shall be validated and the results published in a Site Validation Report. The report shall be used in the final site selection for detailed design and construction. Approved of final site selection will be by the Deputy Assistant Secretary for SPR.

3.3.1.8 Site Development

Preparation of sites for development of regional petroleum storage facilities shall be governed by the performance criteria set forth in this section.

3.3.1.8.1 Existing Facilities Disposition

In some cases existing facilities on the sites will need to be relocated, demolished, or abandoned in place. When the value of a facility significantly exceeds relocation costs, the facility shall be considered for relocation. When relocation is not justified or when facilities interfere with construction or operations, existing onsite facilities shall be demolished.

3.3.1.8.2 Site Conditions

Designs shall accommodate site conditions such as general topography, drainage, and vegetation. Designs shall also accommodate unusual soil conditions such as former dump areas, floodplains, ground instability, rock outcroppings, and unusual soils.

3.3.1.8.3 Orientation

Background information shall be provided for general facilities orientation. Factors to be considered are prevailing winds, existing structures, adjacent site conditions, energy conservation, pollution restrictions, traffic flow, available land, dock facilities, pipelines, and future expansion.

3.3.1.8.4 Earthwork

Sites with gravel, sand, silt, or clay soils shall be tested for acceptable soil bearing capacity. Excavation and embankment, considering shrinkage, shall be balanced and minimized after accommodating civil, architectural, structural, mechanical and electrical requirements. At sites with significant areas of sound rock at or near the surface, embankment may greatly exceed excavation. At unstable sites, preload fills, or surcharges may be provided on a case-by-case basis.

3.3.1.8.5 Grading

Sites shall be graded to direct rainfall runoff away from buildings and toward drainage channels. Containment areas shall be provided for storage tanks or groups of tanks.

3.3.1.8.6 Storm Drainage

The sites shall be drained by open ditches and culverts. Grading shall provide for drainage away from buildings and pavements with minimal ponding except in tank impoundment areas. These areas shall be drained by valved culverts.

3.3.1.8.7 Spill Control

Containment areas with impervious media shall be provided at surface storage tanks to control major and minor spills. Curbs shall separate individual tanks in the event of minor spills. Drainage and curbing shall be designed to direct spills from adjacent valves, motors, and critical equipment. Crude oil and naphtha tanks shall not be placed within a common dike.

3.3.1.8.8 Roads, Parking, Sidewalks

Roads shall connect site facilities as required for maintenance and operations. The roads themselves shall be designed to resist the damaging effects of rainfall. Access roads and parking areas shall provide access to dikes, control buildings, gate houses and off-site roads. Sidewalks and gutters are not required. Barriers to protect pipelines, motors, valves and other critical equipment from vehicular traffic shall be provided. The barriers shall be of a design which shall allow access for maintenance, but shall require special equipment for removal. Traffic control devices shall consist of painted lines and traffic signs. Traffic marking signs and signals shall comply with ANSI and Puerto Rico Commonwealth Standards.

3.3.1.8.9 Perimeter Fencing

Perimeter barbed wire fencing shall be provided near the site property lines. Galvanized chain link fencing with extension arms and barbed wire shall be provided around the perimeter of vital areas within the site. When a vital area perimeter is substantially the same as the property line perimeter, the property line fencing shall be used as the perimeter fencing for the vital area (see Security, para 4.4).

3.3.1.8.10 Curbing

Road sections shall be designed to drain over shoulders into ditches so that curbs are not required. Bumper blocks shall be provided in vehicle parking areas.

3.3.1.8.11 Landscaping

To control erosion, graded areas not occupied by buildings, storage tanks, or pavements will be seeded. Exceptions are surface containment areas for petroleum spills. These areas shall receive soil sterilant treatment and rock or gravel blanket surfacing. Trees and shrubs are not required except for buffers near adjacent residential areas. Earth dikes shall be unsurfaced. Sodding, ditch check dams, asphalt straw mulch, riprap or jute matting shall be provided in small areas subject to erosion.

3.3.1.8.12 Solid Waste

Since small quantities of solid waste are anticipated, outdoor containers shall be provided for periodic removal by truck.

3.3.1.8.13 Access

Distances between tanks onsite shall meet or exceed minimum distances established by NFPA 30 for tank storage. Distance between the site and other petrochemical operations such as refineries, marine terminals, and loading racks shall be optimized within available site acreage but shall not be less than the distances specified by NFPA 30.

Access for fire fighting equipment shall be provided on at least two sides of each storage tank.

3.3.1.8.14 Future Expansion

Site plans shall allow at least one logical expansion direction for each function even though real estate is not initially available for expansion.

3.3.1.8.15 Design Latitude

These criteria shall be considered goals. Conflicts are likely on specific sites. Designers shall identify potential criteria violations and requirements for criteria revisions. These problems shall be brought to the attention of the design management agency without delay as potential problems occur.

3.3.2 STORAGE CONTAINERS

All containers selected for storage either existing or constructed shall be certified for storage for a minimum life of 20 years. The containers shall be structurally stable and designed to prevent loss of product and to provide 99.5 percent recoverability of the product.

3.3.2.1 Steel Tanks

Tanks shall conform to API 650 "Welded Steel Storage Tanks." Tanks over 20,000-barrel capacity will be drain-dry, covered, floating roof, welded steel types. Mixers shall be installed in each tank storing crude oil to ensure that the oil is homogenous during drawdown. Tanks shall be provided with valves, gauging hatches, and covered floating roofs. A maximum of four tanks per firewall is permitted.

Tanks shall have standard diameters. Heights of tanks are not standardized and the heights shown in API Standard 650 are for information purposes only. In selecting tank dimensions the highest tank compatible with permissible ground loading and economic fabrication will normally be chosen.

The use of the cone roof with double-seal, internal pan, floating deck-type tank shall lend itself better to the problems of long-term storage of crude oil and naphtha on the island of Puerto Rico. The covered roof shall provide protection from the extreme rain which at some sites on the Island exceeds 10 inches and shall provide shading which shall have some advantage in reducing the vapor losses since crude and naphtha are both fairly high vapor pressure products.

All internal pan floaters shall have double seals of a type as recommended by the manufacturer for crude oil and naphtha storage. Tanks shall be painted an aluminum color to reflect heat; thereby, reducing loss of light ends.

3.3.2.2 Concrete Tanks

Cut-and-cover storage will be considered where terrain is appropriate. Storage containers will be concrete, steel-lined and containing mixers for use during drawdown. Tanks shall be earth-covered and

graded for a esthetic value and erosion control. A vapor recovery system will be provided for hydrocarbon emission recovery. An inert gas system shall be provided for use during fill and drawdown to satisfy safety requirements.

3.4 OPERATIONAL MODES

The storage facility shall provide 1.3 million barrels of storage which includes 800,000 barrels of crude oil and 500,000 barrels of naphtha. The crude shall be further broken down into separate storage of 400,000 barrels of sweet crude and 400,000 barrels of sour crude. The naphtha shall consist of 125,000 barrels of paraffinic, and 375,000 barrels of aromatic naphenic. The facility shall be constructed for a 20-year minimum life.

3.4.1 FILL

The SPR facility shall be capable of being filled within one year via one crude oil and one naphtha pipeline from the dock to the storage site. A 30,000-dwt tanker shall be capable of unloading the naphtha or crude oil in 30 hours. Tank farm piping shall require only single line distribution since filling and drawdown shall be done separately. All valving within the facility shall be manual except for automatic shut-off to the tanks in the event of tank overfill. Fill shall be accomplished using the ship's pumps through the metering station and pipeline to storage tanks.

3.4.2 STANDBY

The site shall maintain a posture of readiness to allow drawdown to begin within a 24-hour notice. The site standby operational scenario shall provide for periodic cycling of motors/pumps, valves, and other equipment essential for drawdown. Bypass piping shall allow simulated fill or drawdown operations. Bypass or redundant equipment will be provided to allow for maintenance on equipment requiring extended downtime.

Telecommunications shall be maintained on a 24-hour round-the-clock basis between the site control room and the terminal to receive the crude oil or naphtha.

3.4.3 TURNOVER AND INTERNAL/EXTERNAL CYCLING REQUIREMENTS

The storage facility shall not be required to turnover crude oil during the life of the project. However, laboratory tests of samples from each tank shall be conducted every 12 months to assure crude oil quality suitability. Naphtha shall be turned over every two years. Additionally, periodic sampling of naphtha shall be conducted to assess the formation of gums. If gums begin to form, naphtha shall be replaced earlier. No provisions shall be made for internal/external cycling of the crude oil or naphtha.

3.4.4 DRAWDOWN

The Puerto Rico facilities shall be in a response posture to initiate drawdown within a 24-hour notice. Pumps at the storage facility shall transport the oil through the pipeline and the terminal metering station to an adjacent refinery or to the dock for shipment. Separate pumping and piping shall be provided for both crude oil and naphtha to ensure the naphtha is not contaminated by the crude. Drawdown of all stored products will be accomplished within 45 days.

3.4.5 REFILL

Refill of the storage facilities shall follow the same procedures as paragraph 3.4.1. Since naphtha drawdown is at two-year intervals then so is the refill interval. Drawdown of crude oil is expected to occur at an average of five year intervals; therefore, refill shall occur following each drawdown.

3.5 OPERATION AND MAINTENANCE SUPPORT

3.5.1 SUPPORT FACILITIES

The support facilities shall include a guard or gate house and control building/fire station. The control building/fire station shall include the control room, fire station offices, restrooms/locker rooms, a first aid room, and lunchroom.

3.5.1.1 Architectural

- Space criteria and personnel occupancy shall be based on user requirements.
- All architectural design shall conform to applicable portions of the Uniform Building Code (UBC), the Life Safety Code (NFPA No. 101), and other codes and standards referenced therein unless local codes and standards are more stringent.
- Design for the physically handicapped is not required.
- Railings, stairs, platforms, and ladders shall conform to the requirements of 29 CFR 1910.21 through 1910.27.
- Floors, walls, ceilings, partitions, and doors of the Control Building and the Guard Station shall be finished with a surface that is easily cleaned.
- Separate lunchroom space, minimum 13 square feet per person, shall will be provided in the Control Building.

- Toilet facilities based on the projected employee load shall be provided in the Control Building. Cove base, watertight construction in flooring and sidewalks to a height of 5 inches shall be provided.

- A two-hour fire-rated wall shall separate the high bay shop and fire truck garage area from the rest of the Control Building.

- The use of asbestos, polyethylene, or other potentially toxic types of insulation is prohibited.

- All windows shall be wired fire glass or glazed with shatter-proof plastic glazing.

3.5.1.2 Structural

Structural designs shall utilize material efficiently, provide maximum usable space, minimize the use of special equipment, and be constructed by conventional methods. Consideration shall be given to future uses of the structure, possibilities of alterations, and maintenance costs.

3.5.1.3 Modular Design

Modular design features shall be coordinated with architectural requirements favoring repetition of units. Beam depths and spacing, column spacing, floor heights, locations of openings, and clearances are typical considerations.

3.5.1.4 Type of Framing

Wall bearing versus framed structure determination shall be made before selecting the type of framing system.

3.5.1.5 Method of Design

- Combined Loads. The system or method of construction shall be capable of withstanding a rational analysis considering load combinations. Live loads shall be placed to produce maximum and minimum stresses especially where there is a possibility of stress reversal. Structures to resist the effects of seismic events shall be designed with loads obtained from the Uniform Building Code.

- Allowance of Deflections. Elastic deflection of any structural member shall not exceed the limit deflection established in American Concrete Institute (ACI), Building Code Requirements for Reinforced Concrete; or American Institute of Steel Construction (AISC) Specification for Design, Fabrication, and Erection of Structural Steel for Buildings.

3.5.1.6 Design Loads

• Load Assumptions. The load assumptions, except for seismic, shall be in conformance with ANSI A58.1.

• Application of Loads to Structures and Elements. The basic design loads shall be applied to structures and their elements in accordance with the provisions of ANSI A58.1, Building Code Requirements for Minimum Design Loads in Buildings and Other Structures, except as otherwise indicated herein.

3.5.1.7 Wind Loads

Wind loading on buildings and structures shall be in accordance with American National Standard ANSI A58.1.

3.5.1.8 Seismic Loads

Seismic loading on buildings and structures shall be in accordance with Uniform Building Code, Chapter 23 for Zone 3.

3.5.1.9 Concrete Design

• Concrete. Concrete shall be designed in conformance with ACI Building Requirements for Reinforced Concrete. The selection of the framing strength of concrete and reinforcement shall be based on economic considerations, taking into account the specific type and size of structure and construction cost factors for the building site.

• Slabs on Grade. Concrete slabs on grade shall be designed in conformance with Portland Cement Association publications, "Slab Thickness Design of Industrial Concrete Floors and Grade."

3.5.1.10 Masonry Design

Design of masonry walls shall be in accordance with Uniform Building Code, Chapter 24.

3.5.1.11 Structural Steel

Structural steel shall be designed in conformance with AISC Manual of Steel Construction. The type of steel, the system framing, and the design method employed shall produce the required structure at the least cost. Steel sections specified shall be standard and readily available.

3.5.1.12 Welded Structures

Welded structures shall be designed on the basis of steels recommended in AISC Manual for Steel Construction. The welding shall conform to AWS D1.1, Structural Welding Code.

3.5.1.13 Foundation

The foundation design shall be based on a foundation report showing the results of the subsurface investigation that gives recommendations for type of footings and the allowable soil bearing.

3.5.1.14 Plumbing

All plumbing shall comply with the National Plumbing Code.

3.5.1.15 Piping

Piping shall be designed to allow the proper flow rate for drawdown and fill. Fill shall be based on the existing refinery capacities. Piping internal to the tank farm shall allow individual fill and drawdown of each tank. Manual or automatic-operated valves shall be determined by economic, safety and other considerations. Automatic shutoff valves to the tanks will be provided in the event of overfill. All piping shall comply with ANSI B31.4.

3.5.1.16 Pumps

Pumps shall comply with API Standard 610. All pumps for steel tanks shall be horizontal screw-type pad-mounted. Pumps shall be sized for the drawdown rates specified. All pump stations shall be provided with a spare backup pump to prevent critical shutdown during fill or drawdown operations.

3.5.1.17 Metering

Meters shall be provided for custody transfer of media out of the storage facility. Meters shall be turbine type unless positive displacement is called for at an existing site. Meter provers shall be provided to compensate for temperature and gravity. Provers shall comply with API Standard 2531. Meters will be designed in accordance with API Standard 2534 for custody transfer of oil. Meter selection shall be based on $\pm$ 0.25 percent accuracy and an expected 20-year-minimum life.

3.5.1.18 Launcher/Receiver

A launcher/receiver shall be provided at each end of the crude oil pipeline to purge, clean, and inspect the pipeline.

3.5.1.19 Mixers

Mixers shall be installed in each tank storing crude oil to ensure that the oil is homogenous during drawdown.

3.5.2 ELECTRICAL POWER

Electrical systems shall comply with National Electrical Safety Code (ANSI C2), National Electrical Code (NFPA 70), and API RP 500-C. Class I, Group D explosion-proof requirements shall be met as required for Division 1 and 2 explosion-proof locations and general purpose locations.

3.5.2.1 Power Sources

Power sources shall consist of one or more commercial power lines. Where economically feasible, a primary loop or two independent commercial sources, with suitable physical isolation to reduce likelihood of simultaneous loss from a single disaster, shall be utilized.

3.5.2.2 Substations and Switchgear

Substations and switchgear shall be double-ended with 100 percent redundancy for transformers with over 600-volt primaries and medium voltage (over 600 volts) feeders serving loads essential to operating the site.

3.5.2.3 Primary and Secondary Distribution

Primary and secondary distribution shall meet the reliability, availability and maintainability goals of the site and all industry safety standards without restricting normal and emergency traffic to or onsite.

3.5.2.4 Emergency Power

Emergency power shall be provided for all critical loads. Static uninterruptible power supplies (UPS) shall serve those portions of communications, instrumentation, and security systems which require continuous power to permit monitoring and security. Diesel generators shall be used for emergency power to critical loads which do not require UPS and as backup power to UPS on extended outages of normal power.

3.5.2.5 Exterior Lighting

Exterior lighting shall include street and area lighting to facilitate night operations and scheduled maintenance. Exterior security lighting shall be provided at each tank, pumping station and

electrical substation with a minimum of one foot-candle on the ground. Lighting at gates shall be of sufficient intensity to enable guards to compare bearers and badges inside a vehicle.

3.5.2.6 Cathodic Protection

Cathodic protection shall be provided as required for all buried ferrous metal pipes or conduits and for bottoms of tanks.

3.5.2.7 Lightning Protection

Lightning protection shall be provided for all hazardous areas and areas containing critical or extensive quantities of susceptible electrical or electronic equipment.

3.5.2.8 Grounding for Lightning Protection Systems

Grounding for lightning protection systems shall be compatible with power system grounds and shall be interconnected where practicable.

3.5.2.9 Motor Control Centers

Motor control centers shall be provided to control and protect low - (600 or less) and medium - (4160) voltage motors and to distribute power to panels and lighting transformers.

3.5.2.10 Interior Electrical Systems

Interior electrical systems shall utilize 120/208 volts for lights, receptacles, and single-phase motors. Power and small three-phase motors shall be supplied from 277/480 volt panels where practicable.

A static grounding system will be provided for all crude and jet storage tanks, pump houses, valve stations, unloading stations, and pipelines. The maximum allowable resistance to ground will not exceed 25 ohms. It is especially important that the floating roof be grounded and bonded to the rest of the storage tank.

3.5.3 COMMUNICATIONS

Each site shall have a reliable communications network established for use during construction and operation. Operational requirements will use commercial, federal, and private telecommunications systems with select lines dedicated to voice and telex.

3.5.3.1 Intrasystem

The intrasystem includes all communications within a site. Both hard wire and radio systems for voice are included in the Intrasystem.

3.5.3.1.1 Telecommunications Systems

Each site shall have the capability of transmitting or receiving data via a telecommunications net. This capability may be either fascimile, teletype, or rapid or Datafax and shall be available for use by authorized personnel only.

Telephones shall be capable of accommodating all normal lines and private line requirements to safety, security, marine terminals and refineries. This telephone system should have automatic, progressive ringing, illuminated access push buttons, appropriate "Intercom" and "Hold" capability, and access to the FTS net. As a minimum two incoming lines shall be available on all telephone devices at the site. A back-up telecommunications system shall be provided during drawdown and fill.

3.5.3.1.2 Radio Systems

Each site shall be equipped with a dual frequency base station of adequate power to cover all limits of the immediate complex, (including pipeline and marine terminal), and emergency channel capabilities for monitoring and transmitting to local fire and law agencies. Onsite dual frequency capability is necessary to isolate maintenance activities from safety and security activities. Both channels shall be monitored simultaneously.

Portable units shall be used by security personnel and maintenance personnel as required, but coordinated through the base station. Vehicles of supervisory and top management personnel as well as fire, safety, and security vehicles, shall be equipped with mobile units. Vehicle radios may be dual frequency.

3.5.4 MONITORING AND CONTROL

3.5.4.1 Local Control Center

The site shall be operated from an onsite control center which is defined as the local control room. All automatic and manual controls will originate from this facility and all measured parameters shall be displayed on a semigraphic panel in the control room. The local control room shall be continuously staffed.

3.5.4.2 Transmittal of Operational Data

All complexes shall be linked with the Project Management Office for transmission of data relative to the status of fill and drawdown modes, and sensitive security matters. This shall be accomplished by voice communications via daily operations' status and summary reports. Written reports of the daily operational status and summary shall be accumulated and transmitted monthly by normal postal delivery.

3.5.4.3 Control System

The control system shall be a direct digital control system, based in the local control room, and shall have selected functional control over fluid transfer, safety, security, and custodial subsystems. The control system will accept all data inputs, process data for use in control algorithms, and route data to display and storage peripherals.

Control signals shall originate in the control room, and automatic control for emergency conditions shall be provided. Control panels shall contain any locally generated interlocks and provide an interface for connecting to the equipment monitoring devices.

Alarm reporting shall be controlled to the extent that alarm functions generated by critical components or devices shall have reporting priority.

In addition to flow, pressure, and temperature indicators, recorders and controllers, adequate alarms and emergency shutdown devices shall be installed to ensure personnel safety and protection of equipment.

Controlled devices shall be designed so that control system failure will result in a device setting which minimizes the overall system impact, safety being considered paramount.

Signals from equipment or processors not directly controlled will be transmitted to the control room for monitoring.

Mainline valves shall be manually operated and equipped with adequate position limit switches for status indication and appropriate pump interlock circuitry. Emergency mechanical shutoff valves shall be provided, where applicable, to ensure failsafe and overall safety integrity.

3.5.4.4 Data Display and Alarms

All measured parameters shall be displayed in the local control room. Data input such as analog signals, alarm actuation, vessel levels, minimum flow, and pressure or temperature limits shall be transmitted to the local control room where it shall be displayed and selected data recorded.

A local control room semigraphic panel shall provide status indicators on the panel flow lines for all critical valves and pumps, and shall have change or status alarms.

Local control room annunciators shall be located so as to be easily observed from the operator's console. Annunciators shall be provided with first-out capability so that the shutdown devices will have an alarm set to provide a warning in advance of the shutdown for appropriate action.

3.5.4.5 Instrumentation Systems

The instrument systems shall provide all sensor input data to the control system. The instrumentation system shall input transducer signals representing temperature, flow, level, speed, gas, density, pH, and conductance to the control system. Instrumentation shall include all local display and readout devices.

Construction materials for instruments or instrument parts in contact with the process fluid shall be identical to those used in the fabrication of the process line or equipment, except in those cases where the design features of an instrument prescribe the use of other construction materials.

Pressure and temperature ratings of instruments, or components which are an integral part of a closed system (such as control valves or level controllers) shall conform with the ratings of that system.

Electrical construction of instruments shall be determined by the location or occupancy as defined by the National Electric Code covering hazardous locations.

Scales and ranges for instruments shall be manufacturer's standard. Accuracy of one percent of scale range will apply unless otherwise specified.

All instrument cabling wire be designed and installed for a minimum 20-year life and will include twenty-five percent additional capacity.

3.5.5 TERMINAL FACILITIES

Due to the relatively small quantity of material to be stored, the site shall be filled and drawn down through existing commercial docks and marine terminals. Therefore, it is of utmost importance that the storage site be associated with existing pier(s)/terminal(s) that can accommodate a 30,000-dwt tanker and be capable of handling specified flow rates.

3.5.6 OIL ACCOUNTABILITY AND CONTROL

Measurement of crude oil and naphtha flow, the quantity in storage, and flow during drawdown is required for accountability, control and custody transfer.

3.5.6.1 Custody Transfer

Custody transfer points are defined as those locations immediately adjacent to and between DOE and non-DOE oil handling facilities. An oil measurement capability shall be required at each point of custody transfer.

3.5.6.2 Accountability

Metering of crude oil and naphtha shall be provided during fill and withdrawal as well as turnover of crude.

3.5.6.3 Leak Detection

The storage area shall be provided with instrumentation to monitor stored levels on a continuous basis. A leak detection system shall be provided to monitor the pipeline interconnecting the storage site and its associated terminal. Leaks in excess of 0.25 percent shall be alarmed. Pipeline leaks which result in a pressure drop of one percent shall be detected and alarmed.

3.5.6.4 Measurement System

Custody transfer metering shall be guaranteed accurate to within plus or minus 0.25 percent. Meters shall have automatic digital readouts for flow rate and totalizing, which can be read remotely at the local control room.

3.5.6.5 Meters/Provers

Turbine meters shall be used exclusively. Provers shall comply with API Standard 2531 and of the mechanical displacement type bi- and uni-directional type. The minimum prover capacity between known points shall be one-half percent of the maximum volume metered in one hour. Crossover manifolds shall be installed for multi-meter proving service.

3.6 INTERFACE CONTROL

The Project Management Office (PMO) is responsible for overall coordination and management of interfaces. An interface control management plan shall be developed which will delineate the responsibilities of government and contractor personnel in the managing and

resolution of interface problems. The plan shall stipulate requirements for identifying and recording interfaces. Implementation of the plan shall not conflict with Configuration Management (CM) and is intended to be an adjunct to the CM program and shall utilize CM procedures to implement interface changes.

3.7 INTEGRATED LOGISTICS SUPPORT (ILS)

Provision shall be made by the systems design and development contractor, as part of the mainstream engineering effort, to develop and achieve a supportable and cost-effective system. Concurrent with system design, a logistics support system shall be developed that ensures that the Reserve will be capable of meeting mission requirements in a cost-effective manner throughout its anticipated life cycle.

3.7.1 Maintenance Planning

The maintenance concept selected for support of the RPR should provide the minimum cost maintenance that assures the system will meet mission requirements throughout its life cycle. Achieving this objective requires the system's maintenance needs be determined, and an evaluation of the various available alternatives which meet those needs.

Maintenance needs are imposed by both system configuration (design) and mission requirements. A reliability block diagram is constructed to identify the systems designed in maintenance needs. This is a system diagram showing the reliability of each system component and their interrelationships. The diagram will identify the reliability of the total system and the probability of failure of each of its parts. From this basic information the scope of the maintenance tasks and the manpower and supply support needed to perform the required maintenance can be determined. Both preventive and corrective maintenance plans can be developed from these data based on the maintenance concept that will meet requirements at the lowest life cycle cost.

3.7.2 Supply Support

Based on spare parts requirements, as determined by the maintenance planning analysis, a supply support system shall be provided. The system shall support the RPR, by the most cost-effective means, and shall be sufficiently responsive to ensure the system will meet mission requirements. Included in the supply support system shall be the procurement of long lead-time materials, provision for the repair of repairables, provision for consumables, and a system for maintaining accountability of spares and repair parts.

3.7.3 SUPPORT AND TEST EQUIPMENT

Provision shall be made for the availability of all support and test equipment required to support the operation and maintenance of systems, equipment, and facilities. Requirements for support and test equipment shall be determined by analysis of anticipated maintenance actions. The own or lease decision shall be made on the basis of life cycle cost.

3.7.4 TECHNICAL DATA

Contractors shall be required to provide data covering operations and maintenance of each component, equipment, and system. Provisions shall be made to catalogue, store, and disseminate this data as required by operations and maintenance personnel. Included in the technical data package shall be a complete set of as-builts, vendor operations and maintenance manuals, and data pertaining to equipment warranties.

3.7.5 FACILITIES

Facilities shall be provided for the storage of spares and repair parts, support and test equipment, and for the housing of operations and maintenance as may be required.

3.7.6 PERSONNEL AND TRAINING

To ensure the availability of personnel with the skills necessary for operation, maintenance, equipment/personnel safety and security, a personnel training program shall be provided. Refresher training shall be provided to ensure necessary skills are retained and upgraded. A training plan, prepared by the O&M contractor and approved by Department of Energy, shall provide the guidance to ensure a continued supply of trained personnel sufficient to meet mission requirements.

3.7.7 LOGISTIC SUPPORT MANAGEMENT INFORMATION

Effective and efficient logistic support management is dependent on timely and accurate information feedback. An ILS management information system shall be established that will provide all the information necessary for efficient operations and maintenance of the RPR. Information such as equipment status, equipment failure modes, system/equipment downtime, repair time/cost, and manpower utilization/cost are examples of the type of system support information that shall be readily available to both the contractor and Department of Energy management.

4.0 SYSTEM ASSURANCE

4.1 QUALITY ASSURANCE

An effective and economical quality program shall be developed in consonance with the RPR program objectives. The program shall:

- Assure adequate quality throughout all areas of RPR development.
- Provide for prevention and ready detection of discrepancies and for timely and positive corrective action.
- Facilitate determinations of the effects of quality deficiencies.
- Include an effective control of purchased materials and subcontracted work.
- Establish adequate but not excessive continuous control of construction activities.

The quality program shall comply with the general policies of MIL-Q-9858, Quality Program Requirements, and MIL-I-45208, Inspection System Requirements.

Where the contractor is required to maintain measuring and test equipment in support of contract requirements, the general policies of MIL-C-45662A, Calibration System Requirements, shall apply.

4.1.1 QUALITY CONTROL

RPR construction contractors shall be required to establish and maintain an effective quality control system. The quality control system shall assure performance of inspections and tests specified or required to verify compliance with contract requirements for materials, equipment, workmanship, fabrication techniques, construction and operations. The system shall cover construction operations, both onsite and offsite, and shall be keyed to the proposed construction sequence. Inspections, tests, and other quality control operations not specifically specified to be performed by the DOE will be the responsibility of the contractor. Quality control for offsite fabricated items shall be the responsibility of the contractor and in accordance with the company's internal procedures. Exceptions to this are those cases in which the DOE specifically designates certain inspections or tests. Modifications onsite, following the construction period shall require the same quality control as specified by DOE.

4.2 SYSTEM EFFECTIVENESS

4.2.1 RELIABILITY/AVAILABILITY/MAINTAINABILITY (RAM)

The primary purpose of RAM is to assure that system/equipment design is capable of achieving and maintaining the operational requirements in the most cost-effective manner. For an RPR complex it is pertinent to quantify RAM goals in terms of availability of the facility to perform in accordance with the specified mission rates.

Quantitative RAM requirements and analyses shall be applied to those systems, subsystems, and equipment items that are critical to the mission capability and where safety is involved.

Application of quantitative RAM shall be on a selective basis for mission equipment, utilities systems, and mission related support facilities. For such systems and equipment, an initial analysis will be performed to select the subsystems that are critical to mission availability. Only those selected as critical shall be assigned RAM goals and subjected to quantitative RAM analysis.

For noncritical missions, utilities, or support subsystems reliability and maintainability design considerations shall incorporate the requirements for spare equipment, repair parts, maintenance equipment, and maintenance personnel.

Reliability of the Reserve shall assure the prescribed drawdown rates be achieved with a probability of success not less than 0.90 over a period of 1100 operating hours.

Mean Time to Repair (MTTR) items directly affecting major modes of operation shall not exceed 8 hours. The 90th percentile maximum time to restore the operation of a major operational mode shall not exceed 17 hours.

Redundancy shall be provided for critical withdrawal equipment or systems which are subject to a high probability of failure or malfunction.

RPR contractors shall be required to give careful consideration to the maintainability of the equipment used in critical systems as determined from the RAM analysis. Contractors shall determine requirements for test, checkout, inspection, disassembly, assembly, and component replacement and incorporate in the design adequate provisions to facilitate performance of all troubleshooting, corrective, and preventive maintenance tasks. The contractor shall provide an estimate of the meantime to restore the equipment.

If deemed necessary by the DOE, the contractor shall be directed to conduct a demonstration of the inherent installed maintainability of the assembled equipment. Should maintainability demonstrations be required, the demonstrations shall be carried out at the time shop tests are performed or at the most advantageous time.

MIL-STD-470, Maintainability Program Requirements (for Systems and Equipment), MIL-STD-471, Maintainability Demonstration, and MIL-STD-472, Maintainability Predictions, shall be used as guides in conducting the maintainability program.

4.2.2 HUMAN ENGINEERING

A human engineering program shall be conducted as a part of the overall system effectiveness. Human engineering considers the man-machine interfaces and environmental adaptations for maximum human flexibility. SPR contractors shall consider all human engineering aspects toward minimization of human error. This program shall consider all aspects of equipment transportation, installation, operation and maintenance. MIL-STD-1472B, Human Engineering Design Criteria for Military Systems, Equipment and Facilities, shall be used as a guide in conducting the program.

4.3 SAFETY

It is the policy of the DOE to assure that the design of facilities, equipment, and systems provide an optimum, safe, and healthful work environment in which operations and maintenance personnel are not exposed to avoidable risks in the performance of their duties. To achieve this purpose, it is required that:

- Safety considerations be totally defined, implemented, and integrated during project development.
- Field changes and Engineering Change Proposals (ECPs) be controlled so as not to negate safety considerations.

DOE Order 5480 for "Establishment of the Environment, Safety Health (ESH) Program in DOE" shall be used as a guide in the planning and execution of the SPR Safety Program.

Design of facilities and equipment shall consider and incorporate the applicable OSHA design standards set forth in 29 CFR 1910. Deviations from OSHA standards shall not be permitted.

Each design element shall monitor and control the application of safety codes, standards, policies, and procedures to ensure that

they are consistently, uniformly, and effectively applied. The DOE Safety Engineer shall provide guidance and information regarding the application and intent of safety documents.

4.3.1 SAFETY ANALYSIS

A total system safety analysis shall be performed as early in the design phase as possible. Its purpose shall be to identify hazardous conditions that may occur during construction, operation, or maintenance so that they may be eliminated or controlled. The preferred method of hazard reduction is to eliminate hazards through design of an inherently safe facility or control hazards through engineering controls, such as design solution, material selection, or substitution, if the hazard cannot be eliminated. Hazards that cannot be eliminated or controlled through design and engineering measure shall be controlled to an acceptable level through the use of safety devices or features, warning devices, and administrative controls, and personal protective measures in that order of precedence.

4.3.1.1 Safety Devices

Safety and fail-safe devices shall be used to the maximum. Reliance on operating procedures to assure safety of personnel shall not be allowed except where the lack of technology or the constraints of operational effectiveness preclude elimination of the hazard.

4.3.2 CONSTRUCTION SAFETY

All construction work must comply with the requirements of the OSHA Construction Safety Standards 29 CFR 1926.

Prior to commencing construction operations, the contractor shall update the design system safety analysis to include construction equipment, personnel, and procedures. The system safety analysis shall be the basis for a comprehensive Accident Prevention Plan that considers, as a minimum, industrial hygiene, and human engineering. This accident prevention plan shall contain specific hazard control measures for each phase of construction, e.g., earthwork, concrete placement, steel erection, and mechanical work.

The contractor shall be required to establish a hot work permit system to control all welding, cutting, brazing, and other operations which significantly increase the potential for accidental fires.

Smoking and No Smoking areas shall be established and clearly posted. Applicability of local plant safety rules shall have to be coordinated prior to award of the construction contract.

Safety shower/emergency eyewash stations are required within 25 feet of locations where employees may be exposed to crude oil and petrochemicals. These locations include but are not limited to the unloading station on the marine dock, pump houses, major valve stations, and the shop area of the Control Building.

4.3.3 FIRE PROTECTION

The designer shall be required to study the probability of sharing fire protection systems with adjacent refineries and/or users. The sharing of fire protection responsibilities shall be pursued provided no significant risk is encountered at the site and that the combined fire protection systems are in accordance with standard practices and meet or exceed the requirements of the National Fire Protection Association. DOE shall monitor and control the application of standards, policies, and procedures to ensure that systems are economically sound and are effective in providing the level of protection required. Any conflicts between fire protection systems and other facility requirements shall be reported to the DOE. Major deviations must receive written approval of the Strategic Petroleum Reserve Management Office (SPRPMO), Office of Technical Assurance (TA).

An effective fire protection system must competently provide four functions: detection/alarm, containment and diversion, equipment/facilities, and fire fighting procedures.

4.3.3.1 Detection/Alarm

Fire detection equipment must be properly selected for the specific site and must be adequately maintained to ensure its readiness at all times. Systems that monitor the operation of the detector heads and automatically actuate an alarm shall be a minimum requirement. Fire detection and alarm systems shall operate from a "no-break" power supply to ensure they continue to operate despite main electrical power outage.

4.3.3.2 Containment and Diversion Systems

Fire containment in support buildings and facilities shall be provided by fire walls and/or cutoffs in these structures. Ratings shall be in accordance with NFPA 80, 90a, 90b, 101, and 220. Diversion and oil containment shall be provided by proper drainage, via dikes trenches, and flame stops. Drainage should be provided to minimize the flow of fire protection water or burning liquids past exposed pipe or uninvolved pumps.

4.3.3.3 Equipment/Facilities

Equipment required for effective fire fighting at a major oil storage facility should include pressurized fire water distribution facilities, foam or chemical equipment, and portable/mobile equipment.

4.3.3.3.1 Distribution System

The distribution system shall consist of a reliable water supply, pumps as necessary to maintain system pressure, hydrants, and sprinklers. Water can be obtained from a nearby body of water, from wells, or from a municipal system. Specifically, two water supply systems should be provided at each site when required to ensure the reliability of the supply.

4.3.3.3.2 Sprinkler Systems

Sprinkler systems shall comply with the criteria in NFPA 13 and NFPA 15. All systems shall utilize equipment and devices approved or labeled by Underwriter's Laboratories for the specific intended use.

Systems selected must meet DOE requirements for residual pressure that shall provide the required density over the assumed area of sprinkler operation.

4.3.3.3.3 Hydrants

Fire hydrants shall be UL-listed and mounted and fitted with backups according to NFPA 24 and NFPA 194. A sufficient number of hydrants shall be provided so that the hose stream demand can be met without more than 750 gpm from an single hydrant. Hydrants should be located to provide ready access to all parts of buildings, tank farms, and pumping facilities.

4.3.3.3.4 Foam Systems

Foam protection is used primarily for extinguishing flammable liquid fires. Systems include hard lines and monitor nozzles for manual protection, prepiped systems for storage tank protection, and foam water sprinkler or spray systems for protection pump and meter pads. The installation of these systems should comply with requirements of NFPA 11, 11a, and 11b.

4.3.3.4 Firefighting Procedures

To be effective, these procedures must be conceptually developed, tested, and modified for effectiveness in accordance with

site specific requirements and conditions. They must be promulgated to all involved personnel and be implemented through training, practice, and fire drills.

4.4 SECURITY

Physical security shall be implemented to prevent theft of government property, malicious damage, or vandalism which would impair the capability of the facility to function as required. Physical security shall also verify and ensure that physical measures have been incorporated to safeguard personnel and prevent unauthorized access to the complex.

The DOE Security Offices shall serve as point of contact for security engineering, technical consultation, and interpretation of security requirements.

Security requirements shall be uniformly applied to all elements, subsystems, and systems which constitute the physical security system. Therefore, it is essential that security factors be applied during design, procurement, and construction. The designer is responsible for incorporating these physical considerations into structural, civil, architectural, and other features of the RPR complex.

Security concepts shall consider the most economical method to provide the protection specified and indicated in Table 1, and shall include the following:

- Vital Areas
- Aboveground Tanks
- Pipelines
- Communications
- Perimeter
- Pumps and Manifolds
- Water Systems
- Control Rooms
- Electrical Substations

TABLE 1
REQUIREMENTS MATRIX

Area	Vital	Fence	Ltg.	IDS	CCTV	Patrol Access	Pers. Gate
Main Gate		X	X	X	X	X	X
Control Room	X	X	X	X	X	X	X
Pumps & Manifolds	X	X	X	X	X	X	
Storage Tanks	X	X	X	X		X	
Substations	X	X	X	X	*	X	X

*To be determined based upon site specific conditions.

4.4.1 VITAL AREA

A vital area is defined as critical buildings, systems, components, and equipment whose loss would deny the ability to withdraw the oil from storage. Items which could be replaced or repaired within five (5) days and buried pipelines are not to be considered "vital." Examples of "vital" areas are: mainline oil pumps, control valves, switchgear, power transformers, control rooms, etc.

The site layout, structure separation, terrain, etc., will determine the actual configuration of vital areas.

4.4.1.1 Closed-Circuit Television (CCTV)

Closed-circuit television shall be used for surveillance of vital areas where site conditions limit access, prevent patrol observation, or is of a critical nature that requires periodic monitoring, such as main access routes, control room access routes, and pump facilities. The designer shall evaluate the need for CCTV at other areas that might require surveillance.

4.4.2 PERIMETER

Fence lines shall be kept clear of vegetation, trash, equipment, and other objects which could impede observation. Where practicable, adequate clearance shall be maintained between fence lines and adjacent interior or exterior areas which might afford concealment for potential intruders.

Gates shall be either locked or manned by a security officer. All entrances shall be posted to authorize searches of all entering and exiting vehicles and personnel. At those sites where perimeter integrity would be compromised by current non-RPR access, alternate routes shall be located or constructed when feasible. If this is not possible, the original area shall be subdivided into separated defined entities, permitting thoroughfares which will not jeopardize site security. Perimeter lighting is required at all gates and at those areas where exposed pipelines and power transmission lines enter the site.

Sufficient intra-site roadways shall be provided to allow roving patrols to visually check perimeter boundaries and critical areas, and to respond rapidly to any alarms.

Implementation measures for each facility may, however, indicate unusual site specific circumstances that dictate the use of an intrusion detection system (IDS) and shall be required if so indicated by DOE.

4.4.3 PUMPS AND MANIFOLDS

In the event pumps and manifolds are not collocated, separate protection philosophies are defined. As a minimum, the manifold equipment shall be fenced and lighted as previously defined for vital areas. Oil pumps and their associated aboveground connections shall be located within a substantial containment building or area with access control. Both interior and exterior lighting of the building or area should be provided. Operational data shall be monitored to provide information concerning pressure and flow of crude oil, and motor temperature and vibration to aid in detecting security problems. An electronic intrusion detection system will be provided.

4.4.4 STORAGE TANKS

Storage tanks shall be secured as vital areas and shall be suitably illuminated and fenced as previously defined. However, at sites where the perimeter access control system is found to be sufficient, the fence around tanks may be omitted. An electronic intrusion detection system for storage tanks is required. Information obtained from the normal operational monitors shall be adequate to verify proper functioning of the tanks or to indicate that a problem exists.

4.4.5 LOCAL CONTROL ROOM

The control room houses the electronic equipment utilized to monitor the flow of products. Although the system is manually operated, vital system measurements must be monitored and communicated to others

in order to sustain efficient drawdown operations. Intrusion detection system alarms shall be monitored from the control room and relayed to the security headquarters. In addition, communication links to the security force, to onsite personnel controlling pumps and valves, to terminal operators, and to the RPR security office must be maintained. The structure housing the control room shall be hardened to reduce the probability of unauthorized entry; doorways, windows, and other openings shall be secured. The communications center shall be located in the control room which shall be manned at all times. Illumination of the exterior of the building is required.

4.4.6 PIPELINES

Security patrols and normal operational monitors are adequate to detect any failures which may occur and shall allow the system to be safely shut down without major losses. Operational data regarding pressure levels in the system shall provide a secondary, but indirect, method for monitoring valve positions and pipeline failures.

A high level of security is not required for the pipeline. Burial, whenever practical, makes access to the pipeline more difficult.

4.4.7 ELECTRICAL SUBSTATION

Power to operate the RPR equipment shall be obtained from commercial electric utilities. If the commercial source is interrupted or disabled, crude oil or products cannot be moved. Therefore, physical protection of critical components in the electrical system is a vital part of the security philosophy.

The power transformers shall be fenced as previously defined for vital areas and illuminated according to 3.5.2.5. Shielding around the transformers shall be provided to prevent disablement by rifle fire. Electronic intrusion detection systems are required. In addition, the substation shall be checked frequently by roving patrols.

4.4.8 COMMUNICATIONS

The communications network shall be controlled from a communications center located in the local control room. Additionally, a secondary backup communications center shall be located at a separate security headquarters normally located at the main access control gate.

The radio equipment shall consist of base, mobile, and hand-held radios. Each member of the security force shall be equipped with a radio. At least two radio frequencies shall be available for use. Radio communication with city, county, and state police shall be established and tested periodically to insure performance. Telephone communication connecting onsite and offsite locations shall be provided for

day-to-day usage and for emergency backup to the radio system. The radio base station and telephone communication capabilities shall provide independent means of communicating from each site facility to the security office.

4.4.9 PERSONNEL

The security force at each site shall have direct liaison with the security office. Overall security operations shall be coordinated from the security office during National emergency periods. The general security force guidelines contained in the DOE Interim Management Directive No. 6105, "Physical Protection of DOE Property," are generally applicable to the RPR facilities. These guidelines are directed at protection of DOE property against damage.

4.4.9.1 Onsite Personnel

A minimum of two security personnel shall be on duty at all times. Security personnel shall be licensed and, when practical, deputized and bonded. Arms shall depend upon site location and environment as defined by DOE policy.

The security force shall be responsible for controlling access to the site, to protected areas within the site, for patrolling the site, and as practical, to protect nearby sections of the RPR system. One guard shall man the security headquarters at the main entrance and control ingress and egress from the site. This guard shall also monitor radio frequencies and conduct searches of personnel or vehicles deemed necessary. Annunciators for intrusion detectors, if used, shall be housed at the local control room and alarms communicated to the security headquarters. Additional guard(s) shall randomly patrol the site at intervals not to exceed two hours, respond to alarms, and patrol the offsite pipelines. Occasional security patrols of the pipeline shall be made. Throughout all patrols, security personnel shall communicate with the local control room and security headquarters at predetermined intervals.

To aid the security force in identifying authorized individuals, an ID badge system is required. Badges shall be coded to display authorization for access to any interior controlled areas such as the local control room, electrical substations, etc. The badging system shall be designed to control access of company employees, government employees, contractors, subcontractor, and visitors.

Security personnel shall also perform the following functions: apprehend persons or vehicles gaining unauthorized access; check areas of security interest during non-working hours to determine that they are properly secured and otherwise in order; report unusual

circumstances; perform essential escort duties; implement and enforce the established system of control over the removal of material from the site; respond to protective alarms signals (if any are used) or other indications of suspicious activity; and act as necessary in the event of situations affecting the security of the facility including industrial accidents, fires, internal disorders, and attempts to commit espionage, sabotage, or other malevolent acts. Security personnel will not normally be required to become integrally involved in fire fighting activites but should continue their functions to maintain site integrity and vehicle control.

4.4.9.2 Supplemental Security Force

As the need arises, the onsite security force shall obtain backup assistance from local law enforcement, fire and other organizations. DOE Security shall prepare written agreements and procedures for request and use of such assistance. During extreme circumstances, the services of the state and national armed forces may be required. Written agreement for request and use of such services shall be made and confirmed annually by DOE Security.

4.5 ENVIRONMENTAL

The site will employ appropriate measures to ensure that enviromental impacts associated with the activities of the site are avoided or minimized to the extent possible within the framework of the RPR. As a minimum requirement, each site shall follow mitigation techniques specified in the Revised Programmatic EIS, the Site Specific EIS, the Programmatic Environmental Action Report, and the Site Environmental Action Report. In addition to reducing environmental impacts by mitigation techniques, each site shall obtain and comply with all required Federal, State and local air, water, and solid waste discharge permits and monitoring requirements.

4.5.1 WATER SUPPLY

The site shall be provided with a source of potable water to meet the demand of the design population. The quality of the water supplied shall meet the specifications of the Environmental Protection Agency's Interim Primary Drinking Water Standards (IPDWS). Water requirements may be met by purchasing water from local public (or private) utility companies or by producing water on site from wells or surface impoundments. Water purchased or produced on site shall be treated and/or tested to meet the EPA's IPDWS requirements.

The distribution system shall be sized to provide adequate quantities of water at the desired pressure. The system shall be kept as simple as possible.

4.5.2 WASTEWATER SYSTEMS

The site shall have adequate systems for the treatment/ disposal of sanitary sewage, oily wastes, industrial wastes, and storm water runoff. Sanitary wastewaters may be treated onsite and discharged to the environment or discharged to sanitary sewer systems for treatment at public or private wastewater treatment facilities. Oily and industrial wastewaters may be treated onsite and discharged to the environment or pretreated and discharged to sanitary sewer systems. Whenever possible separate stormwater drainage systems shall be provided.

4.5.3 BALLAST WATER

Ballast water treatment facilities shall be provided to produce an effluent that meets Federal and State discharge requirements. The system shall consist of, at least, a surge tank and oil-water separation facility.

4.6 SITE ACCEPTANCE

4.6.1 ACCEPTANCE TESTING

The overall objective of acceptance testing is to ensure that all equipment, systems and support facilities are tested in adequate depth to ensure that program objectives are met. Complex acceptance shall be determined through consolidated factory, construction, and operational tests which satisfy equipment, subsystems, systems, and integrated systems tests.

The basic method or procedure to be employed by the Project Management Office to determine the acceptability of a complex system, or equipment is to have specific test requirements and procedures developed concurrent with the design effort and include them in the construction contract. The tests shall then be performed and the system, complex or equipment must pass those tests to the satisfaction of the Government prior to acceptance. In most cases the systems being installed or constructed will be an assemblage of proven vendor equipment and will not require long-term operational tests. It is normally a matter of demonstrating satisfactory operational performance and performing specific system and equipment testing to ascertain that design, construction and installation work was performed to specification.

4.6.1.1 Factory Tests

In the case where Government-Furnished Equipment (GFE) is provided the Government shall be responsible for specifing and monitoring factory tests. For Contractor-Furnished Equipment (CFE) factory tests requirements shall be implemented by construction and other prime

contractors. Testing will be adequate to confirm that the equipment is in accordance with design requirements selected CFE tests may be monitored by the Government.

4.6.1.2 Construction Tests

Construction tests are those tests normally performed by the construction contractor during the construction phase. Generally, these tests consist of basic mechanical, electrical, and hydrostatic tests to ensure proper installation and construction and are not considered a test of equipment performance or operational capability. Specific tests and demonstration requirements for acceptance of equipment installation, interconnecting piping, utilities interface, and other related construction work shall be developed during design and specified in the construction contract. Monitoring of the tests will be the responsibility of the construction manager.

4.6.1.3 Operational Testing

Operational tests shall include startup and performance tests. Startup is the initial step-by-step procedures that shall be followed to begin the transfer of product through the system. Proper verification of previously required tests shall be performed prior to startup. Performance tests shall demonstrate that the system will perform as defined by the criteria. Upon completion of appropriate start-up tests, and at such a time that the site is capable of being filled or withdrawn, performance tests shall be accomplished by actual fill and withdrawal operations.

The construction and site operations manager shall be responsible for all coordination and conducting of tests. The site operations manager shall make available at the beginning of tests trained personnel, operating and maintenance manuals, and procedures required to operate the site upon execution of turnover.

4.6.2 CERTIFICATION

Certification shall be conducted for each storage container to be used for long-term storage of crude oil and naphtha. The contractor shall be required to provide a written certification.

4.6.3 DEMONSTRATION TESTING

The complex may be exercised on a quarterly basis. Exercising the complex is considered part of the operational tests and will indicate that each system is functioning as necessary to allow complex drawdown rates and subsequent fill rates to be achieved.

Plans and procedures will be developed inconjunction with the private sector to assure drawdown and fill objectives can be attained and also to verify that the complex will be capable of making the transition from standby mode to drawdown mode in 24 hours.

5.0 CONFIGURATION MANAGEMENT

The establishment of a formal system for the accounting, identification, control and approval of configuration changes affecting the Regional and Noncontiguous Petroleum Reserve Project (RPR) has been initiated by the Project Management Office. Configuration Management policies shall be followed by all agencies and activities, Government and contractors, during design, construction, operation and maintenance of the RPR.

The configuration management program is based on the concept of establishing approved baselines, controlling changes to these baselines, recording and auditing the approved configuration. Implementation directives and procedures provide for:

- Early establishment of configuration baselines.
- Expeditious processing of proposed changes to include coordination with all affected agencies.
- Expeditious decision by the Project Configuration Control Board (PCCB) or appropriate management level where necessary.
- Timely incorporation of approved changes.
- Timely visibility of configuration and change status to management at all levels.
- Avoidance of waivers or variances of security, explosive safety and Occupational Safety and Health Act (OSHA) requirements.

Changes to the baseline configuration, once established, shall be minimized and will generally be made only in the interest of:

- Correction of deficiencies or resolution of conflicts as required to achieve operational requirements.
- Significant improvement in operation or performance.
- Incorporation of advances in the state-of-the-art.
- Compliance with revisions in environmental standards.
- Safety.

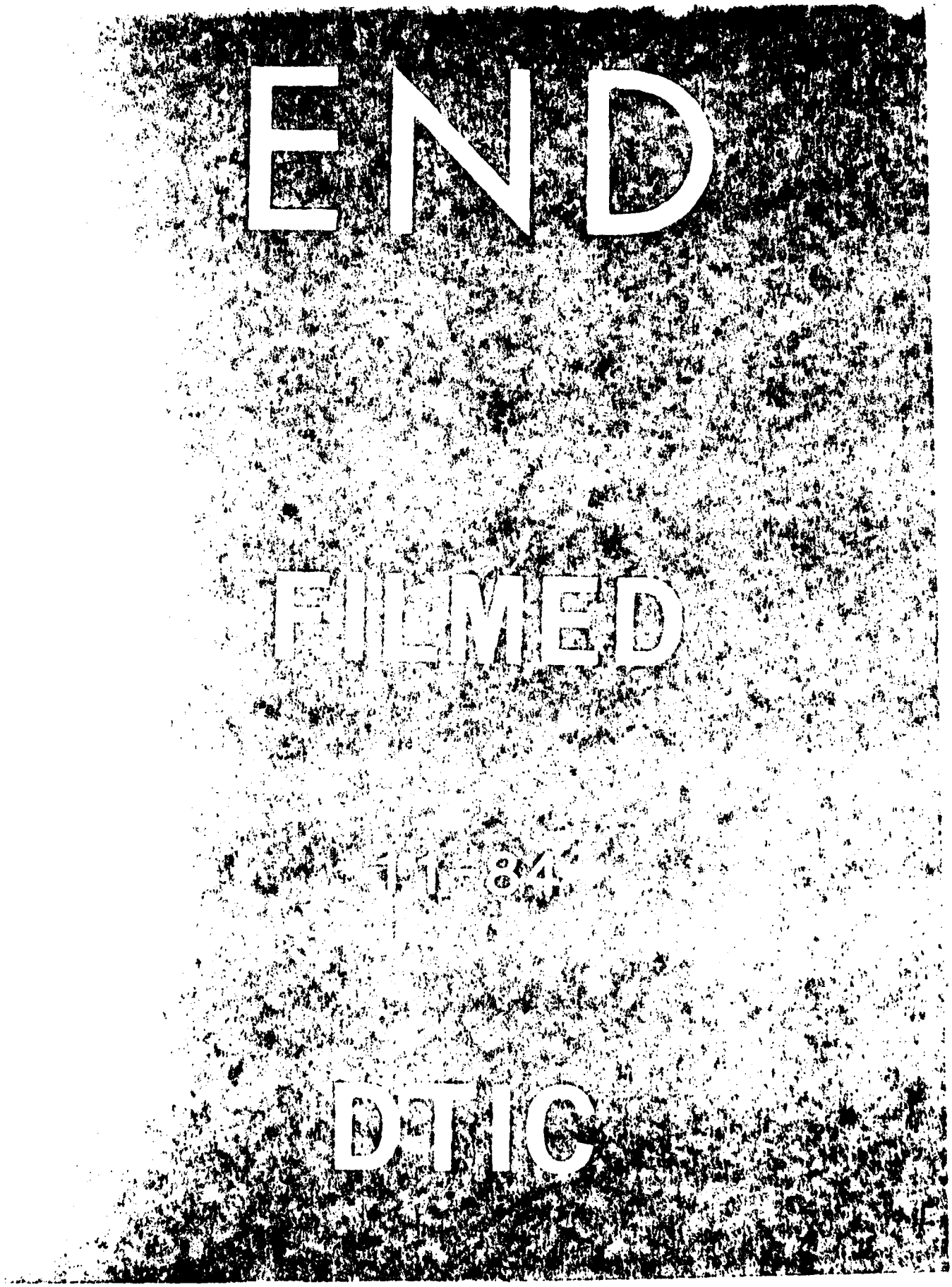
- Value Engineering.

- Cost reduction.

It shall be essential that the development and evaluation of Class I and Class II changes include full consideration of security, safety, and OSHA requirements because of security problems and accident potential inherent in the operation and maintenance of a storage complex.

The Project Manager is responsible for the Configuration Management Program. As Chairman of the PCCB, the PM shall call regularly scheduled meetings and conduct the business of the agenda and shall prove or disapprove all Class I changes submitted to the board.

The configuration management program shall be conducted in accordance with the Configuration Management Policy established by DOE.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